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ADDENDUM

In *Gleichenia* subgenus *Diplopterygium* the following species must be placed:

Gleichenia deflexa Holtt., *sp. nov.*

Rami rhacheos 120 cm vel ultra longi, maximi 35 cm lati, rami minores (steriles) interdum 18 cm lati; pinnulae omnes angulo c. 75° deflexae; pinnulae maximae 16—20 cm longae, 3.5—3.8 cm latae, costae 4—5 cm inter se distantes (costae ramorum minorum sterilium 2.5—3.5 cm inter se distantes) ; costulae 4—5 mm inter se distantes, medii rectangulariter patentes, infimae interdum leviter deflexae; lamina tenuis, segmenta c. 20 paria basi leviter constricta (i.e., supra basin ampliata), ala angustissima laminae conjuncta, segrnentum infimum foliolum disjunctum constatum; venae utroque basi prominentes, cetera planae; sori sporangiis 3—5 constati; f oliola stipulif ormia.ad 4 cm longa, bipinnatif ida, segmenta 1 mm lata. Paleae apicis rhacheos c. 10 mm longae, haud 1 mm latae, pallidae, margine brunneo setis brevibus obliquis nitidis praeditae; rami rhacheos costaeque utroque primo paleis parvis et pilis stelliformibus coarctis paleis elongatis angustis intermixtis vestiti, demum plus minusve glabri et verruculosi; venae infra pilis stelliformibus pallidis adspersis praeditae.

NEW GUINEA. Papua. Fergusson Island, 800 m, climbing to 6 m in rather open rain forest in steep ravine, *Brass 27171* (L, typs). Normanby Island, Mt Palinama, 850 m, scrambling to 7 m in tall mossy forest, *Brass 25736* (L).

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THE GENUS FIRMIANA MARSILI (Sterculiaceae)

A. J. G. H. KOSTERMANS *

SUMMARY

1. *Firmiana* Marsili and *Erythropsis* Lindley are congeneric.
2. *Firmiana* Marsili links *Sterculia* L. and *Scaphium* Schott & Endl.
3. Eight species are recognized: *Firmiana eolorata* (Roxb.) R. Br.; *F. diversifolia* A. Gray; *F. fidgens* (Wall, ex King) Corner; *F. hainanensis* Kosterm.; *F. major* Hand.-Mazz.; *F. papuana* Mildbr.; *F. philippinensis* Kosterm.; *F. simplex* (L.) W. F. Wight.
4. Seventeen binomials are referred to other genera.

While a paper on *Firmiana* was in the press, I received some additional, important information from the Kew Herbarium and from Mr. J. E. Dandy of the British Museum. These "Additional Notes" were placed at. the end of the article.

In a subsequent letter that reached me when the article already had been printed and issued**, the problem of *Firmiana simplex* was solved, thanks to the tenacity of Mr. Dandy. Moreover, *F. fulgens* came into flower in the Bogor Botanical Garden, which enabled me to add some field notes and photographs.

We had in mind to incorporate the paper in "Reinwardtia" in its original form, but due to the additions, mentioned above, it was considered better that it should be rewritten to this new, separate publication.

FIRMIANA*** Marsili

Firmiana Marsili *in* Saggi Scientifici e Letterari dell' Accademia Padova 1: 106-116, *tab. 1 & 2.* 1786; Lamarck-Podret, Encycl. meth. 7: 432. 1806 (as a syn. under *Sterculia platanifolia* L.f.; excl. syn. *Culhamia* Forsk.) ; Steudel *(Firmiana* Medic.), Nomencl. 343. 1821; ed. 2, 1: 642. 1840 (as a syn. cf *Sterculia* L.) ; DC, Prodr. 1: 481. 1824 (as a syn. of *Sterculia* L.); Bartling, Ordin. 340. 1831 (as a syn. of *Sterculia* L.) ; Schott & Endlicher, Melet. bot. 33. 1832; Spach, Hist. Veg. phan.

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** Published under the title "The Genus Firmiana Marsili" as Communication no. 54 of the Forest Research Institute, Indonesia, in December 1956, p. 3-33.

*** Named for count K. J. von Firmian, born 1716 at Deutsch-Metz in Tirol, died 1782 Milan, an Austrian statesman who was Governor of Lombardy under Maria Theresia.

3: 516. 1834; Meissner, Gen. 31 (25). 1837; Reichenbach, Handb. 291. 1837; Nomencl. 202. 1841; R. Wight, Illustr. Ind. Bot. 1: 77. 1840; Endlicher, Gen. 994. 1840 (as a submenus of *Sterculia* L.); Suppl. 4 (3): 61. 1857; Enchir. 516. 1841 (as a submenus of *Sterculia* L.); R. Brown *in* Bennett & Brown, PL Jav. rar. 235. 1844; Walpers, Rep. 5: 104. 1846; Lindley, Veg. Kingd., ed. 3: 362. 1853; Miquel. PI. Nederl. Ind. 1 (2) : 178. 1859; Bentham *in* Benth. & Hook, f., Gen. PI. 1: 218. 1867 (as a subgenus of *Sterculia* L.); Baillon, Hist. PI. 4: 60. 1872 (as a section of *Sterculia* L., excl. syn. *Carpophyllum* Miq.); Pfeiffer, Nomencl. 1 (2): 1353. 1874; Masters *in* Hook, f., Fl. Brit. Ind. 1: 359. 1874 (as a section of *Sterculia* L.); Pierre, Fl. for. Cochinch. 3, fasc. 13: *t. 198.* 1889 (as a syn. of *Sterculia* L.); Schumann *in* Engl. & Prantl, Nat. Pfl. Fam. 3 (6) : 97. 1895 (excl. syn. *Hildegardia* Schott & Endl. and *Scaphium* Schott & Endl.); Koorders & Valeton *in* Meded. Lands PI. tuin Buitenz. 14: 160. 1895; de Dalla Torre & Harms, Gen. 313. 1903; Hutchinson & Dalziel, Fl. W. Trop. Afr. 1: 251. 1928; Alston *in* Trimen, Handb. Fl. Ceylon 6 (Suppl.) 31. 1931; Lemée, Diet, descr. 3: 126. 1931 (excl. syn.); Kanjilal & Das, Fl. Assam 1 (1) : 154. 1934; Ridley *in* Kew Bull. 1934: 214 (as a syn. of *Erythropsis* Endl.); Gamble, Fl. Madras 1: 106. 1935; Shun Ching-Lee, For. Bot. China 824. 1935; Corner, Ways. Trees Mai. 1: 610. 1940; Little, Checklist Trees U.S.A. 185. 1953; Kostermans *in* Bull. Jard. bot. Bruxelles 24: 335-338. 1954; Comm. For. Res. Inst. Bogor 54: 3 - 33. 1956. — *Erythropsis* Lindley *in* Brandes, Quart. J. Sci. Lit. Arts 1: 112. 1827; *in* Bot. Reg. *t. 1236.* 1829; Veg. Kingd., ed. 3: 362. 1853 (as a syn. of *Firmiana* Marsigli); Schott & Endlicher, Melet. 33. 1832; Spach, Hist. Veg. phan. 3: 517. 1834; Meissner, Gen. 31. 1837; R. Wight, Illustr. Ind. Bot. 1: 77. 1840; Endlicher, Gen. 994. 1840 (as a subgenus of *Sterculia* L.), Enchir. 516. 1841 (as a section of *Sterculia* L.); Suppl. 5: 61. 1850; Steudel, Nomencl. ed. 2, 1: 597. 1840; Reichenbach, Nomencl. 202. 1841; Bentham *in* Benth. & Hook, f., Gen. 1: 218. 1867 (as a syn. of the subgenus *Firmiana* Mars.); Pfeiffer, Nomencl. 1 (2): 1259. 1874; Boerlage, Handl. Fl. Ned. Ind. 1: 123. 1890 (as a syn. of *Sterculia* L.); Ridley, Fl. Mai. Pen. 1: 277. 1922; *in* Kew Bull. 1934: 214-217 (*Erythropsis* Endl.); Lemee, Diet, descr. 3: 15. 1931 (excl. descript.); Burkill, Diet. econ. Prod. Mai. Pen. 1: 950. 1935; Adelbert *in* Backer, Fl. Java, (Nooduitg.) 4b, Fam. 107: 25. 1944; Kostermans in Bull. Jard. bot. Bruxelles 24: 335-338. 1954. — *Clompanus* [Rumphius] 0. Kuntze, Rev. 1: 77. 1891. — *Karaka* Rafinesque, Sylv. Tellur. 72. 1838; Merrill, Index Rafin. 167. 1949. (p.p.).

TYPE SPECIES.—*Firmiana, simplex* (L.) W. F. Wight.

Trees. Leaves often cordate, glabrous or with stellate hairs, with long petioles. Flowers often in coralliform panicles, brightly coloured, covered with stellate hairs, unisexual (perhaps sometimes polygamous); calyx with a more or less developed tube with nectarial disc at base inside; corolla none. Androgynophore growing out of the tube after anthesis; androecium consisting of usually 10 shortly stipitate or sessile, 2-celled anthers opening longitudinally; the filaments attached to the margin of the sunken top of the androgynophore; ovaries 5 (enveloped by the stamens), conglutinate; styles short, stigmas curved outwards. After anthesis the ovaries soon separate and expand, opening in an early state of development, one or two pairs of ovules at the margins. Male and female flowers differ only slightly in size and in development of the

androecium or gynaecium. Follicles papery, dispersed with the adhering seeds.

DISTRIBUTION.—Asiatic continent, Malaysia, Pacific Islands.

The genus was originally included in the older genus *Sterculia* L. (Sp. pi. 1007. 1753; Gen. pi., ed. 5: 438. 1754). Created as a separate genus by Marsili (sometimes wrongly spelt Marsigli) in 1786, *Firmiana* has been alternately included in *Sterculia* L. and reinstated again as a proper genus. Endlicher (Gen. pi., I.e.) considered *Firmiana* Mars., like *Erythropsis* Lindley, a subgenus of *Sterculia* L.; in his Suppl. (I.e.), he adopted R. Brown's view in accepting it as a proper genus and dividing it into two sections: *Eufirmiana* Endl. (type species: *Sterculia platanifolia* L.f.) and *Erythropsis* (Lindl.) Endl. (type species: *Sterculia colorata* Roxb.), differing in the size of the flower tube in comparison to the lobes. This subdivision was generally accepted, but not the status of *Firmiana.* — R. Brown (1844) recognized *Firmiana* as a proper genus; Bentham (1867) reduced the genus again to a subgenus, herein followed by Baillon (1872), Masters (1874) and Brandis (1874). — Pierre (*t. 198.* 1889), although enumerating the specimens under *Sterculia* L., emphatically stated that *Firmiana* was a proper genus. Schumann (1893) reinstated *Firmiana,* incorporating *Hildegardia* and *Scaphium.* into that genus.

Ridley (1922 and 1934) not only considered *Firmiana* a good genus but also *Erythropsis,* a view formerly presented by Pierre.

Lemée (Diction, descript. 3: 15. 1931) gives a wrong description of *Erythropsis* Lindl., which he confused with *Pterygota.*

The present author (1954) accepted *Firmiana* as a proper genus; *Erythropsis* was considered to be congeneric with it.

Firmiana is closely related to *Sterculia* and may be differentiated from that large genus only by its membranous fruit, which is dispersed with the adhering seeds, whereas in *Sterculia* the follicles are leathery and the seeds are dispersed separately; furthermore the inflorescence is often different.

On the other hand *Firmiana.* is also related to *Scaphium* and *Pterocymbium,* the difference being in the usually 2-seeded fruit (the seeds are marginal) of the former, as contrasted with the basal, one-seeded fruit of the latter. In this sense *Scaphium* and *Pterocymbium are* closer to *Hildegardia* of which the fruit does not open at all and reminds one of a samara, as found in *Tariettia* and *Heritiera.*

In flower characters the above-mentioned genera cannot be separated.

Saunders (in Ann. Bot. 45: 97-103. 1931), after examining the vascular bundles, came to the conclusion that the calyx actually represents

a combination of calyx and corolla. Her ingenious hypothesis that each carpel represents actually1/2 -l-1/2 carpel, which would explain the peculiar venation, is however not in agreement with the position of the ovules.

The position of the radicles, often serving to point out affinity of genera, is so variable in *Stercniliaceae* that it is not of much use (see Pierre). *Culhamia* Forskål (Fl. Aeg.-Arab. 96. 1775), formerly included in *Firmiana* Mars., was relegated to *Cola* by Pfeiffer (Nomencl. 1: 289. 1870), although not definitely. Kuntze (Rev. 1: 78. 1891) remarks that the shape of the leaf and the inflorescence, as described by Forskål, point to *Firmiana.*

Rafinesque (Sylv. Tellur. 73. 1838, descr. op. cit. 158. 1838) coined the name *Culhamia triloba.* Merrill (Index Rafin. 167. 1949) considers this species to be identical with *StercuUa setigera* Delile.

In his lengthy article *, Marsili discussed the tree, flowers and fruit of a specimen of *F. platanifolia* grown in the Botanical Garden of Padua. On page 116 he gives a Latin diagnosis of the genus. The two drawings are exceptionally good, the first one represents an inflorescence accompained by drawings of male and female flowers, the second one depicts the young and opened fruit.

In a note on page 116 he remarks that *StercuUa platanifolia* L.f. (Suppl. Plantarum 423) is the same species. Linnaeus fil. received a specimen from Alstroemer, who in turn got it perhaps from Marsili; Alstroemer brought it to Sweden. The contention of Linnaeus fil. that the flowers are hermaphroditic, is, according to Marsili, attributable to the poor state of the dried material available to Linnaeus fil.

Marsili apparently did not intend to describe a species or to procure a specific epithet, but his drawings manifestly represent *F. platanifolia* ,and he mentioned *StercuUa platanifolia* as being identical with his plant; hence I follow the current custom to attribute the combination to Marsili.

Much controversy exsists in the matter of the sexes. In a recent Flora (Kanjilal) the flowers are considered hermaphroditic, although most botanists are of the opinion that they are unisexual. In all species I could examine there are male and female flowers in the same inflorescence. In the male flowers we find minute, sterile ovaries. The anthers in the female flower are not smaller (sometimes even larger) than those in the male flower, but they do not open. I have not been able to make sure whether their pollen are viable.

The number of anthers indicated by different authors varies between

* I obtained a photographic reproduction through the courtesy of Prof. Dr. C. G. G. J. van Steenis.

10 and 30. I suppose that there are only 10 anthers, each with two cells, As in other *Sterculiaceae* the anther cells are either parallel, which results in a regular ring of anthers, or the cells are not at the same level and often one is turned in another direction than the other, (upwards or downwards), which results in an irregular globular clump of cells, somewhat resembling a knot of wool.

KEY TO THE SPECIES

1a. Carpels and follicles densely pilose 2
b. Carpels and follicles glabrous or nearly so 4
2a. Leaves entire 3
b. Leaves deeply lobed . . . . *6. F. simplex*
3a. Lower leaf-surface glabrous . . . . *3. F. philippinensis*
b. Lower leaf-surface densely pilose (matted) . . . . *7. F. papuana*
4a. Calyx lobes very short, erect or incurved 5
b. Calyx lobes long, reflexed, lanceolate-oblong 6
5a. Lobes *Vs* of the tube length. Lower leaf surface softly pilose. Flower tube inside and androgynophore glabrous . . . . *2. F. fulgens*
b. Lobes % of the tube length. Lower leaf surface glabrous, but for the axils of the main nerves. Flower tube inside and androgynophore sparsely pilose. *1. F. colorata*
6a. Leaves lobed; lower surface grey, densely pilose (matted); follicle up to 15 cm long. Leaf-base cordate . . . . *4. F. major*
b. Leaves entire; lower leaf surface densely pilose (matted), follicles up to 7,5 cm long. Leaf base truncate or subcordate . . . . *8. F. hainanensis*
c. Leaves entire or lobed. Lower leaf surface practically glabrous. Follicles up to 7 cm long . . . . *5. F. diversifolia*

1. FIRMIANA COLORATA (Roxb.) R. Br.—Fig. 1, 2, 3

Firmiana colorata (Roxb.) R. Brown *in* Bennett & Brown, PI. Jav. rar. 235. 1844 (quoad var. a); Walpers, Rep. 5: 104. 1845-46, p.p.; Miquel, Fl. Ind. bat. 1 (2): 178. 1859 (excl. var. *ft* (?) et *y* et spec. Korthalsii) ; Thwaites, Enum. 29. 1864 (nomen); Trimen, Fl. Ceylon 1: 166. 1893 (as a syn. of *StercuUa colorata* Roxb.); Masters *in* Hook, f., Fl. Brit. India 1: 360. 1874 (as a syn. of *StercuUa colorata* Roxb.) ; King *in* J. As. Soc. Bengal 60 (ii) : 71. 1892; K. Schumann *in* Engl. & Prantl, Nat. Pfl. Fam. 3 (6): 97. 1893; Koorders & Valeton *in* Meded. PI. tuin Buitenzorg 14: 160. 1895 (excl. spec. Korthalsii); Atlas *t. 406.* 1914; Koorders, Exkurs. Fl. Java 2: 598. 1912; Koorders-Schumacher, Syst. Verz., Fam. 178: 20. 1913; Gagnepain *in* Lecomte, Fl. gen. Indoch. 1: 459. 1911 (as a syn. of *StercuUa colorata* Roxb, excl. var.); Backer, Schoolfl. Java 1: 135. 1911 (as a syn. of *StercuUa colorata* Roxb.); Gamble, Fl. [illegible] 1: 107. 1935; Merrill *in* Philip. J. Sci. 14: 246. 1919; Enum. Born. PL 380. 1921 (quoad nomen tantum); *in* Lingnan Sci. J. 13: 63. 1934; Adelbert *in* Backer, [illegible] Java, (Nooduitg.) 4b, Fam. 107: 25. 1944 (as a syn. of *Erythropsis colorata* (Roxb.) Burk.) ; Kosterm., Comm. For. Res. Inst. Bogor 54: 7-16, *f. 1, 2, 3.* 1956. — *StercuUa colorata* Roxburgh, PL Coromand. 1: 26. 1795 (quoad *tab. 25,* descript. excl.) ; Hort. beng. 5. 1814 (nomen); Fl. Ind. 3: 146. 1832 (reprint 3: 507. 1874), quoad nomen; Willdenow, Sp. pi. 2: 873. 1799; Lamarck-Poiret, Encycl. meth. 7: 432. 1860, p.p.;

Persoon, Synops. 2: 240. 1807; Steudel, Nomencl. 814. 1821; ed. 2, 2: 639. 1841; DC, Prodr. 1: 483. 1824, p.p.; Sprengel, Syst. Veg. 3: 83. 1826, p.p.; G. Don, Gen. Hist. 1: 517. 1831; Schott & Endl., Melet. 33. 1832 (as a syn. of *Erythropsis roxburghiana* Schott & Endl.); Spach, Hist, Veg. phan. 3: 516. 1834 (as a syn. of *Erythropsis roxburghiana* Schott & Endl.), p.p.; Wight & Arnott, Prodr. 63. 1834; *in* Hooker's Icon. 2: *t. US.* 1837; R. Brown *in* Bennett & Brown, PI. Jav. rar. 235. 1844 (as a syn. of *Firmiana colorata* R. Br., quoad var. a); Moritzi, Verz. 28. 1845-46 (nomen) ; Hasskarl *in* Tijdschr. Nat. Gesch. 12: 115. 1845 (nomen); Dalzell & Gibson, Bombay Fl. 23. 1861 (n.v.); Thwaites, Enum. 29. 1864 (nomen); Bentham *in* Benth. & Hook., Gen. pi. 1: 218. 1867; M. R. Brown, PI. Wild Fl. S. & W. India *tl 8* (n.v.) ; Beddome, Fl. sylv. 32. 1869 (n.v.); Pfeiffer, Nomencl. 1 (2): 1353. 1874; Masters *in* Hook, f., Fl. Br. Ind. 1: 359. 1874; Brandis, For. Fl. 34, 1874 (excl. syn. *Sterculia wallichii* Falc.) ; Ind. Trees 84, *fig. 40,* 190,6, p.p.; Kurz *in* J. Asiat. Soc. Bengal 43 (ii) : 117. 1874; For. Fl. Burma 1: 138, 1877; Pierre, Fl. for. Cochinch. 3, fasc. 13: *t. 199.* 1889; King *in* J. Asiat. Soc. Bengal 60 (ii) : 71-72. 1892; Watt, Diet. 6: 361. 1893 p.p.; Talbot, Trees Bombay 22, 1894 (n.v.); For. Fl. Bombay 1: 141-142. 1909; Woodr. *in* J. Bomb. Nat. 11: 129. 1897; Koorders & Valeton, I.e. 160. 1895 (as a syn. of *Firmiana colorata* Mars.); Trimen, Handb. Fl. Ceylon 1: 166. 1893; id. 6: (Alston): 31. 1931; Cooke, Fl. Bombay 1: 125. 1903; Backer, Schoolfl. Java 1: 135. 1911; Gagnepain *in* Lecomte, Fl. gen. Indoch. 1: 459. 1911 (var. *bracteosa* Gagn. excl.); Tardieu-Blot, Suppl. 1: 401. 1945; H. A. Clerx *in* Trop. Natuur 1: 10-13. 1912, *cum fig.;* Haines, Fl. Bihar & Orissa 2: 76. 1921; Gamble, Man. Ind. Timb. 96. 1922; Ridley *in* Kew Bull. 1934: 215 (as a syn. of *Erythropsis colorata* Ridley) ; Parkinson, For. Fl. Andam. Isl. 101, *fig. 16.* 1923; Craib, Fl. Siam. Enum. 1: 166. 1925; Kanjilal, Kanjilal, & Das, Fl. Assam 1 (1): 151. 1934; Gamble & Fischer, Fl. Madras 107. 1935; L. H. Bailey, Stand. Cyclop. Hort. 3: 3239. 1947. — *Erythropsis colorata* (Roxb.) Burkill *in* Gard. Bull. S.S. 5: 231. 1931; Ridley *in* Kew Bull. 1934: 215; Adelbert *in* Backer, Fl. Java, (Nooduitg.) 4b, Fam. 107: 26. 1944; Mooney, Suppl. Haines, Bot. Bihar & Orissa 28. 1950 (quoad nomen tantum). — *Clompanus colorata* (Roxb.) 0. Kuntze, Rev. Gen. pi. 1: 78. 1891. — *Karaka colorata,* (Roxb.) Rafinesque, Fl. tellur. 72. 1838; Merrill, Index Rafin. 167. 1949. — *Erythropsis roxburghiana* Schott & Endl., Melet. 33. 1832; Spach, I.e. 517, p.p.; Sprengel, Syst. veg. 3: 83. 1826; Spach, Hist. Veg. phan. 3: 517. 1834; Steudel, Nomencl. ed. 2, 1: 597. 1840 *et* ed. 2, 2: 639. 1841 (as a syn. of *Sterculia colorata* Roxb.) ; Voigt, Hort. Suburb. Calcut. 104. 1845; Masters, I.e. (as a syn. of *Sterculia colorata* Roxb.); Koorders & Val., I.e. (as a syn. of *Firmiana colorata* R. Br.). — *Tab. 25 in* Roxburgh, PI. Corom. 1.

Erythropsis colorata, var. *bracteata* (A. DC.) Ridley *in* Kew Bull. 1934 :215. — *Firmiana bracteata* A. DC. in Bull. Herb. Boiss., ser. 2, 3: 369. 1903. — Balansa 3743 (G).

Sterculia rubicunda Wall., Catal. 1119 D, F, G, ex Masters *in* Hook, f., Fl. Brit. Ind. 1: 360. 1874. — Wallich 1119 D, F. G. (K).

Sterculia fulgens (non Wall.) Kurz *in* J. Asiat. Soc. Beng. 43 (ii) : 117. 1874 *(p.p.)* ; For. Fl. Br. Burma 1: 139. 1877 *(p.p.)* ; King *in* J. Asiat. Soc. Beng. 60 (ii) : 72. 1891 *(p.p., quoad specim.)* ; Kostermans, Comm. For. Res. Inst. Bogor 54: 11. 1956 *(p.p.).* — *Erythropsis fulgens* (Wall, *ex* Mast.) Ridley, Fl. Mai. Pen. 1: 277. 1922 *(p.p., quoad specim.)* ; Burkill, Diet. econ. Prod. Mai. Pen. 1: 950. 1935 *(p.p., quoad specim.).* — *Firmiana fulgens* (Wall, *ex* King) Corner, Wayside Trees Mai. 1: 610. 1940 *(p.p., quoad specim.).*

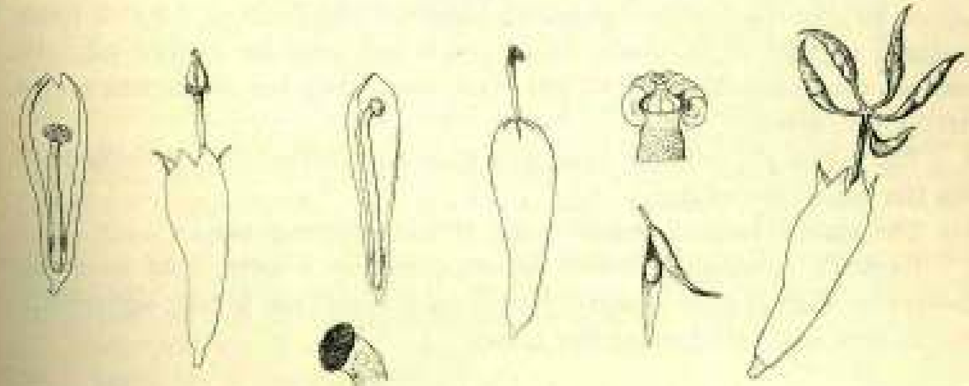


PIG. 1. *Firminia colorata* (Roxb.) R.Br. — Flowering branch (photo: Huysmans, Bogor).



FIG 2. *Firmiana eolorata* (Roxb.) R.Br. - Different leaves (X 0.5). - After living material.

Tree up to 25 m high with smooth grey or grey-green bark. Buttresses up to 2 m high, out 50 cm. Branches glossy dark brown. Branches and the grey or greenish grey branchlets with many lenticels. Terminal bud rather flat, surrounded by densely rusty pilose, ovate-triangular, acute, deciduous bud-scales measuring 1-2 mm. Petiole 10—20 cm long, glabrous, base pulvinate. *Leaf-blade* glabrous (axils of main nerves pilose below; in very young leaves scattereed stellate hairs on lower surface), variable in size and shape, entire or deeply incised, ovate, 6-25 cm long, 6—20 cm wide; top acuminate, base cordate or subcordate; palmately veined; dark green on upper, paler green on lower surface; primary veins slightly raised on upper, raised on lower surface, pale; main ribs 5, rarely 7, arcuate; secondary nerves lax, at right angles from primary nerves, pale; reticulation rather dense.



PIG. 3. *Firmiana eolorata* (Roxb.) R.Br. — (From left to right) Female flower before anthesis; female flower after anthesis; male flower before anthesis; male flower after anthesis; top of androgynophore of female flower before anthesis; young follicle (below); young follicles; (below) top of male androgynophore (all parts slightly less than natural size; tops of androgynophore x 3.3). — After living material.

Flowers in axillary panicles or racemes from the axils of previous year's fallen leaves (as a rule they appear when the tree is bare) ; main peduncle stout, up to 7 cm long, yellowish orange; ramifications slender, short (up to 1 cm long), coralliform. Flowers 3 cm long, densely covered with minute orange stellate hairs and scales; calyx funnel-shaped, somewhat inflated towards apex, slightly curved; teeth triangular, acute, 5—6 mm long, with a conspicuous, flattened, grey-pilose margin; inside of calyx with sparse stellate hairs; above the base a ring of glistening, long bundles of strigose hairs. Androgynophore in mature flowers extending 5—10 mm beyond calyx, covered with very small scale-like stellate hairs. Anthers 10, two-celled; the cells curved; filaments very short, attached to the rim of the shallow tube at the top of the androgynophore. Ovaries 5, flask-shaped (at base knee-like), glabrous, white (red towards the top) later turning pale green, merging into the short, curved, red styles; stigma

bent outside, peltate, pellucid, reddish. *Follicles* up to 7 cm long, membranous, glabrous, veined, stipitate, opening at an early stage; ovules 2-4, ellipsoid, glossy, black, alternate at the margins of the follicle.

The flowers are hermaphroditic in appearance but one sex apparently remains sterile. The male and female flowers occur on the same branch, In the male ones the anthers are smaller than in the female ones, but in the latter the anthers do not open.

The anthers of the male flower already open when it is still closed. After dehiscence of the flower the androgynophore stretches. In this stage the disc of anthers is about 1.5 to 2 mm in diameter; the pollen is smooth; the antherial disc is always bent to one side at an angle of almost 90°. In the female flower the antherial disc is about 1.5 to 2 times as large as that in the male flower; it is not bent (or hardly so) ; the anthers contain pollen, but do not open, even after the stretching of the androgynophore.

The styles and stigmas gradually turn red during their development, like the top of the ovary.

The male flowers develop earlier than the female ones.

Burkill's specimen 6990 is accompanied by a note, that in many flowers the flower tube is partly ripped open from base to top; apparently this is done by birds looking for honey.

DISTRIBUTION.—Indian Peninsula, Burma, Ceylon, Andamans, Siam, Malay Peninsula, Sumatra; introduced in Java.

USE.—The inner bark yields a fibre; twigs and leaves are used as cattle fodder in the Western part of the Indian Peninsula. The wood is dingy greyish white in colour, very soft, marked with conspicuous medullary rays. The roots (tubers) are eaten by the Lepchas.

ECOLOGY.—The tree is frequent in deciduous forests; it is bare in winter (dry season) ; in W. Java it becomes partly or completely leafless before coming into bloom (October, November). In Burma it flowers in March-April (Kurz, Brandis). In Ceylon it flowers in June-July (Trimen).

LOCAL NAMES (these are probably applicable both to *F. colorata* and *F. fulgens.* — India: Bodula, Walena, Samarri (Hind) ; Nustruk (Ajmere) ; Sisi (Kol., Sonth) ; Khowsey (Mar., Berar) ; Maraka, Karu boppaji (Tel.) ; Samari (Oudh) ; Kowsey, Bharkoi, Bheckhol, Samarri, Walena, Bhai-koi (Bomb.) ; Bodala, Bodal (Kumaon) ; Mutruk (Merwara) ; Mula (Beng.) ; Pisi, Sisi (Kol.) ; Bolazong, Bolajun, Chengsu, Walgem (Caro) ; Sito udal, Phirphiri omra (Nepal) ; Kanklyem (Lepcha) ; Jhari-udal, Jari udal, Kath udal (Assam) ; Sangkru-aromy (Mik.) ; Bohog-odla (Mech.) ; Dieng-symphlor, Dieng-Sangkhlor (Kli) ; Lersima (Kharna) ; Burma: Wetshaw, yaseng-shaw; Andamans: Berda; Siam: Paw kao (Loas, Chiengmai) ; Karaka (Telingas) ex Roxb., Fl. Corom.

INDIA. Chittagong: Kodala Hill near Chittagong, Apr., fl., fr., *Badul Khan 496* (CAL); Manbhum, fl., *Rev. J. Campbell s.n.* (CAL). Assam: South Lushai, hills near Fort Lungleh, Apr., fl., *Gage 111* (CAL); Naga Hills, ster., *Anon. s.n.* (CAL). Sikkim: locality not indicated, ster., *Anderson s.n.* (CAL, L). South India: Shevaron Hills, fr., *Perrottet 34* (CAL); Travancore, Santhanpora, Dec, ster., *Meebold 565 — 13257* (CAL) ; ibid., Feb., fl., *Bourdillon 91* (CAL) ; Harsleyhondo-Chittoor Distr., May, fr., *Fischer 4647* (CAL).

LOWER SIAM. Pingah, Dec, fl., *Haniff & Nur 3940* (SING) . Andaman Is.: South Andaman, fl., *Kurz s.n.* (CAL) ; Southpoint, fl., *Kurz s.n.* (CAL.).

MALAYSIA. — MALAY PENINSULA. Pahang: near Jerantut, Feb., fl., *Corner s.n.* (SING). Perak: fl., *Ridley 14640* (CAL, SING); Ulu Kuching, on river bank, Mar., fl., *King's Coll. 8673* (CAL, SING); Kuala Lumpur, Batu Rd., Mar., fl., *Foxworthy 1709* (SING); ibid., Feb., fl., *Burkill 4415* (SING); July, fl., *Curtis 232,2* (CAL, SING). Penang: Govt Hill, Jan., in bud, *Curtis 144* (SING); Head of Waterfall Gardens, Mar., fl., *Burkill 6990* (SING); Ayer hitam, alt. 70 m, ster., Nov., *Haniff s.n.* (SING) ; Penara Bukit, Feb., fl., *For. Guard s.n.* (SING). Kelantan: Sg. Ketah, Gua Nanah, Feb., fl., *Nur 12131* (SING). Selangor: Kepong Plantations, May, fl., *Hussin F.D. 15360* (SING). Locality not indicated, fl., *Scortechini s.n.* (CAL, SING). — SUMATRA. Hoch Ankola, fl., *Junghuhn s.n.* (L); Ranau Lake, alt. 600 m, fl., *Forbes 2105* (L); R. Warkau, alt. 600 m, fl., *Forbes 2106* (CAL). — JAVA. West Java: no loc, fl., *Kuhl & van Hasselt s.n.* (L); no loc, fl., *Zollinger ad 494* (L) ; Bantam, fl., *Spanoghe s.n.* (L) ; Bandung, alt. 700 m, fl., Sep., *Popta 866* (L); Southcoast Sukapura, low nits, fl., *Junghuhn s.n.* (L).

CULTIVATED. Hort. Calc, fr., *von Mueller s.n.* (L) ; fl., *Pierre 2849a* (P). Hort. Bogor. sub XI C 105, fl., (SING).

The original publication of *Sterculia colorata* Roxburgh consists of a description and a coloured drawing. The description, which is slightly emendated in Roxburgh's Flora, indicates the leaves as being broader than long, villose with soft lobes and downy petioles. This part of the description certainly refers to the species, which in our paper is called *Firmiana fulgens.* The description of the flowers is insufficient to' make out, whether the flowers are those of *F. fulgens* or of *F. colorata,* as nothing is said about the length of the lobes of the flower tube.

Roxburgh's plate 25 (which is preserved in the Kew Herbarium, no. 46), depicts without doubt *F. colorata* with tubular flowers with short lobes; a leaf is added in outline, which also belongs to *F. colorata* in our sense, as it is not broader than long. Moreover, in the figure the flowers are orange; those of *F. fulgens* are white.

Consequently Roxburgh's description covers a mixture of two species.

In order to prevent the abolishing of a well-established name for a plant, currently interpreted as *F. colorata,* I adopt here Roxburgh's

plate 25 as the basis of his *Sterculia colorata,* with exclusion of the description (at any rate with exclusion of the description of the leaves; the flower description is so incomplete, that it may cover both species).

Through the courtesy of the Kew Herbarium, I received photographic reproductions of a sheet, marked *Sterculia, colorata* R. Br. with the number 1119, the specimen on which R. Brown based his variety a of *Firmiana colorata.* It consists of a leafy branch; a branch with fruit and a branch with young flowers. This specimen is certainly *Firmiana. colorata* in our sense. A second sheet consists of 4 branches with inflorescences and a couple of loose inflorescence-branches and two loose follicles. The sheet bears four labels, all different. The right hand top label gives the following: 1119 *Sterculia colorata* Roxb. and three different habitat indications, which make it evident that there are three different specimens, one collected in Silhet in 1823, one in Hundnar in 1825, and one from Mungger Hills (marked Herb. Calcutta). The original labels from Hundnar and Silhet are present. The fourth label bears the numbers 1119 D *Sterculia colorata* Hb. Wight; 1119 G *Sterculia colorata* Herb. Roxburgh; 1119 F. *Sterculia rubicunda* Hb. Hamilton (Mt. Mongher).

A third sheet, marked *Sterculia rubicunda,* Mungger 20 July 1811 and 5 April 1811 with an added number 1119a represents *Firmiana colorata.*

Sterculia wallichii Falconer, enumerated by Brandis under *F. colorata,* belongs certainly to *F. fulgens.* The specimen is conserved in the Kew Herbarium and consists of inflorescence bearing branches only.

Korthals' specimen from Mt. Sakumbang in Borneo, is preserved in Leiden. It represents a young twig of *Scaphium macropodum.* This specimen was cited by Miquel and by Merrill.

Ridley (Flora Mai. Pen., I.e.) under *Erythropsis fulgens* gives a description of the species, called *F. fulgens* in our paper. All material from the Malay Peninsula (autographed by Ridley), however, belongs to *F. colorata* with glabrous leaves. I have not seen a single specimen of *F. fulgens* from the Malay Peninsula. *F. fulgens* does not occur in Java.

Brown's third variety King (I.e.) under *Sterculia fulgens* enumerated represented in the British Museum, belongs to *F. colorata.* Forbes 2105 from Sumatra. This specimen is manifestely *F. colorata* with glabrous leaves, contrarily to King's description,. The same holds true for the specimens Scortechini s.n. and King's Collector 8673 from the Malay Peninsula, I think Masters was right in indicating that *F. fulgens* occurs in the tropical Western Himalayan; the species, occuring in Malay, Sumatra and Java is *F. colorata,* with glabrous leaves.

The specimen Wallich 1135 represents *F. fulgens.*

Corner's (I.e.) description of *F. fulgens* covers indeed that species; but his specimens from the Malay Peninsula all represent *F. colorata* with glabrous leaves.

2. FIRMIANA FULGENS (Wall, *ex* Mast.) Corner — Fig. 4, 5, 6

Firmiana fulgens (Wall, *ex* Mast.) Corner, Ways. Trees Mai. 1: 610. 1940 *(p.p., quoad descr.).* — *Sterculia fulgens* Wallich, Cat. 1135 *ex* Masters *in* Hook, f., Fl. Br. Ind. 1: 360. 1874; Kurz *in* J. Asiat. Soc. Beng\ 43 (ii) : 117. 1875, *et* For. Fl. Br. Burma 1: 139. 1877 *(quoad nomen et descr.) ;* King- *in* J. Asiat. Soc. Beng. 60 (ii) : 72. 1891 *(quoad descr., p.p.) ;* K. Schumann *in* Engl. & Pr., Nat. Pfl. Fam. 3 (6) : 97. 1895; Haines, Bot. Bihar & Orissa 2: 77. 1921 (as *a syn. of S. pollens).* — *Clompanus fulgens* (Wall.) O. Kuntze, Rev. 1: 78. 1891. — *Erythropsis fulgens* (Wall. *ex* Mast.) Ridl., Fl. Mai. Pen. 1: 277. 1922 *(quoad descr., p.p.); in* Kew Bull. 1934: 215; Burk., Diet. econ. Prod. Mai. Pen. 1: 950. 1935 *(quoad nomen).* — *Firmiana colorata* var. *ft fulgens* R. Brown *in* Benn. & Br., PI. Jav. rar. 235. 1844. — Wallich 1135 (K).

Sterculia colorata Roxburgh, PL Corom. 1: 26. 1795 *(quoad descr., tab. 25 exclud.);* Fl. Ind. 3: 146. 1832, (repr. 3: 507. 1874). — *Firmiana colorata* (Roxb.) R. Brown *in* Benn. & Br., PL Jav. rar. 235. 1844 *(quoad var. jj) ;* Walpers, Rep. 5: 104. 1846 *(p.p.).*

Sterculia wallichii Falconer *(non* G. Don) *ex* Brandis, For. Fl. NW. & C. Ind. 34. 1874. — Coll. unknown no 26 (K).

Firmiana pallens F. von Mueller *in* Viet. Nat. 3: 48. 1866 *(Combination indicated, bat not made);* (Wall, *ex* King) Kostermans, Comm. For. Res. Inst. Bogor 54: 16. 1956. — *Sterculia pallens* Wallich *ex* Voigt, Hort. suburb. Calc. 105. 1845 *(nomen);* King *in* J. Asiat. Soc. Beng. 60 (ii) : 73. 1891; Hochreut. *in* Bull. Inst. Btzg. 19: 22. 1904 *(nomen);* Brandis, Ind. Trees 84. 1906; Haines, Bot. Bihar & Orissa 2: 77. 1921. — *Erythropsis pallens* (Wall, *ex* Voigt) Ridl. *in* Kew Bull. 1934: 215. — Falconer 289 (K).

Tree up to 20 m high and 1 m in diameter (Haines). Branches thick, densely pilose (matted stellate hairs with short horizontal branches) with large round leaf scars. *Leaves* palmately veined, chartaceous or papyraceous, more or less reniform (broader than long), up to 30 X 25 cm, shallowly 3—4-lobed, the lobes acutish, base cordate; upper surface soon glabrous, lower surface laxly pilose (stellate hairs with long, more or less erect branches) ; veins flat above, prominent below; the 3 main ribs with a 4 pairs of arcuate secondary nerves; tertiary nerves lax, somewhat prominent reticulation inconspicuous. Petioles up to 15 cm long, densely pilose (stellate hairs with erect, short branches), base swollen.

Flowers in panicles up to 25 cm long; peduncle and branches stout. flowers white or pale yellowish, the female ones slightly smaller and more slender than the male ones,or te reverse (both in the same inflorescence and flowering at the same time), subcampanulate, 1.5—2.5 cm long, den- Selly pilose (stellate hairs with long, erect branches) ; lobes 4—6 mm long,



FIG. 4. *Firmiana fulgens* (Wall, ex Mast.) Corner — Flowering branch. — After *H. B. XV J. B. IX 2.*



FIG. 5 *Firmiana fulgens* (Wall, ex Mast.) Corner. — Leafy branch and Dart of inflorescence (x 0.4); flowers (X 2). - After *H.B. XV JB'IX* (BO)

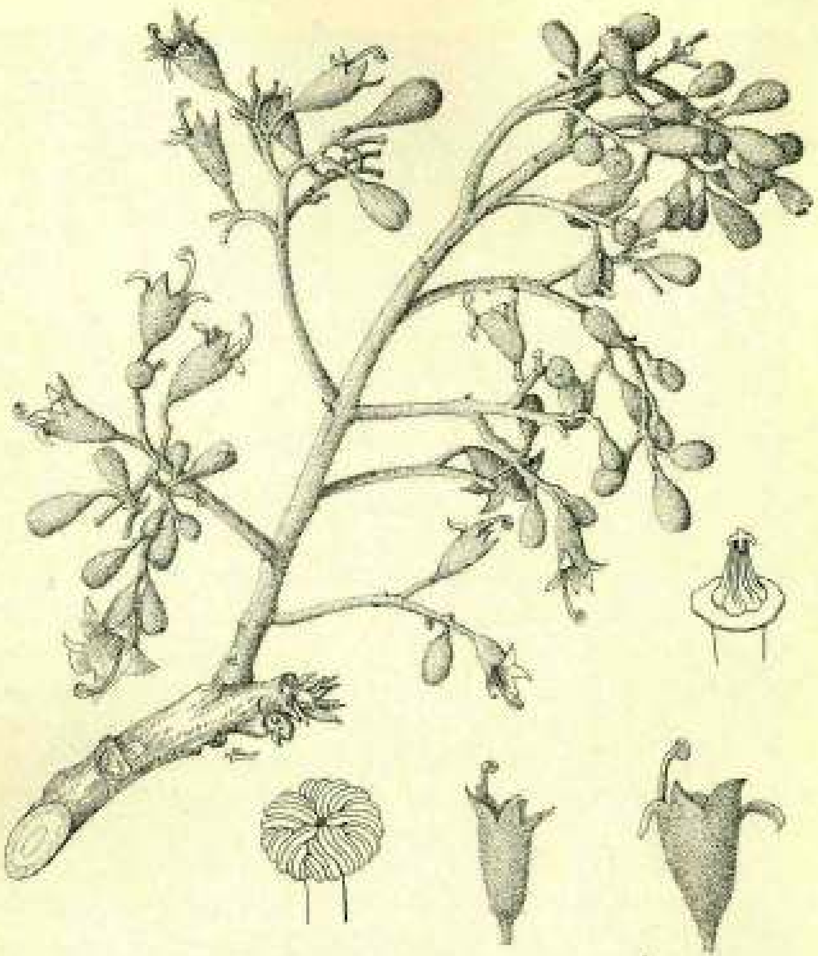


FIG. 6. *Firmiana fulgens* (Wall, ex Mast.) Corner. — Flowering branch (X ½) ; two types of flowers (nat. size; top of male androgynophore (X 5) ; the same but anthers removed (X 5). — After *H. B. XV J. B. IX 2.*

fleshy, the inside with a few hairs (stellate hairs with shorter branches) or glabrous; tube inside glabrous, the base with a fleshy, glossy, dark yellow part (nectary) ; immediately above this glossy part a broad ring of long, strigose hairs." Androgynophore at last exsert, glabrous. Male flowers with large anther-cells (about 20) and undeveloped carpels; female flowers with smaller anthers and flask-shaped carpels, with a few, white stellate hairs at the ventral suture; stigmas slender, recurved. *Fruit* glabrous, not seen.

DISTRIBUTION. — Western Himalaya.

LOCAL NAMES. — Khardala, N.W. provinces (ex Brandis) ; Phap (Th., ex Haines).

The first description of *Sterculia pallens* Wallich should be attributed to King (l.c.) who in a note under *S. fulgens*, differentiated it from the latter species. No type specimen was indicated by King.

Ridley gave the first extensive description under *Erythropsis pallens* Ridley and indicated Falconer 289 (K) as type specimen.

Roxburgh's description of *Sterculia colorata* in his Pl. Coromand. and in his Flora fits *Firmiana pallens* (lower leaf surface and petioles pilose), but the typical funnel-shaped flower with long tube lobes is not indicated. Roxburgh's plate 25 refers certainly to our *Firmiana colorata.*

Masters enumerated the specimens Falconer 289 and Strachey & Winterbottom 2 (K), which are also mentioned by Ridley under *Firmiana pallens.* Furthermore Masters cited: Wallich 1135 and 1119 2. The latter is perhaps Wallich 1119/2, which represents *F. colorata.*

Kurz (*in* J. As. Soc. Beng. 43 (ii) : 117. 1875) under *Sterculia fulgens,* already suggested, that Masters described actually *Sterculia pallens,* which he considered specifically different.

King's and Kurz' description cover each other completely, but the material, cited by King is certainly *F. colorata.* I do not know, why King described the lower leaf surface as densely stellate pubescent, as the specimens, which he enumerated (King's Coll. 8673; Scortechini, and Forbes 2105) have completely glabrous leaves.

Sterculia wallichii Brandis is based on the specimen Falconer 289, which is the type specimen of *Erythropsis pallens* Ridley. The sheet is preserved in the Kew Herbarium and consists of flower-bearing branches only. The label bears the indication: *Sterculia wallichii* and the number 26, and the distributing label Falconer 289 from the Kew Herbarium.

The inside of the flower tube in *F. fulgens* is glabrous, like the androgynophore; in *F. colorata* these parts are pilose.

W. HIMALAYA. Gurhwal, fl., *Falconer 289* (BO, CAL, K, L, P) ; ibid., *Herb. Hook. f. & Thoms. 58045* (CAL) : ibid., *King s.n.* (CAL). Missoorie, 1000 m alt., Apr., fl., *Mackinnon s.n.* (CAL); ibid., May, fr., *Mackinnon s.n.* (CAL). Rajpoor. fl., *Anon. s.n.* (CAL). — CULTIVATED. Hort. Bogor sub XV J B IX 2. fl. * (e horto Saharunpore). Hort. Calc. s.n. (BO, CAL); ibid., fl., *Pierre 3780* (P).

* In flower in January and February 1957: flowers almost white; there are two kinds of flowers, the male ones are smaller and more slender than the female ones; both occur in the same inflorescence (see fig. 4, 6).

3. FIRMIANA PHILIPPINENSIS Kosterm.—**Fig.** 7

Firmiana philippinensis Kostermans, Comm. For. Res. Inst. Bogor 54: 19. 1956. — *Firmiana simplex* (non W. F. Wight) Merrill *in* Philip. J. Sci., Bot. 13: 308. 1918; Enum. Philip, fl. PL 3: 56. 1923. — Fenix 29858 (BO).

Tree. Branchlets thick, soft, filled with soft pith, glabrous, covered with large leaf scars. Leaves entire, crowded near apex of branchlets, soon glabrous, chartaceous, ovate, acute, base subcordate, 9 x 14 cm; nerves

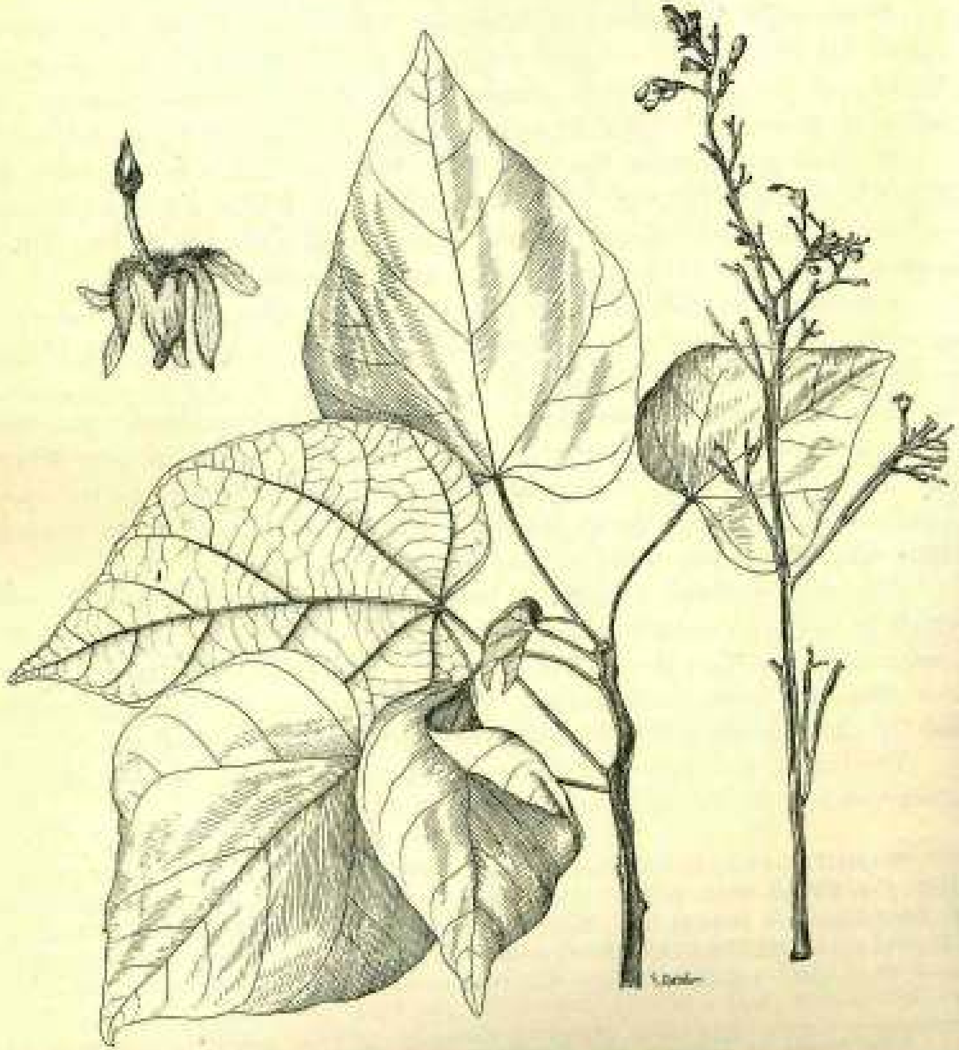


FIG. 7. *Firmiana philippinensis* Kosterm. — Leafy_ branch and inflorescence (X 0.5); flower (X 2.5). — After *Femx 29858* (BO).

palmate. Petioles 7 cm long, glabrous. Inflorescence and flowers as in *F. platanifolia.*

LOCAL NAME.—Bitnong (Pang.), according to Merrill.

The leaves of this species are different from those of *F. simplex.* As the follicles are unknown and the leaves of the type specimens are rather young, these is a possibility that it represents *Hildegardia merrittii* (Merr.) Kosterm. Of the latter species I have never seen a specimen.

PHILIPPINES. Luzon. Prov. Pangasinan, Mt. San Isidro, *Fenix 29858,* fl. Nov. (BO).

4. FIRMIANA MAJOR Hand.-Mazz.

Firmiana major Handel-Mazzetti *in* Anz. Akad. Wiss. Wien, Mat.-Nat. 60: 96. 1923. (1924); Ridley *in* Kew Bull. 1934: 214. (nomen; *maior)*; Kosterm., Comm. For. Res. Inst. Indon. 54: 20. 1956. — *Sterculia platanifolia* var. *major* W. W. Smith *in* Notes roy. bot. Gard. Edinburgh 9: 130. 1916. — *Hildegardia major* (Hand.-Mazz.) Kostermans *in* Bull. Jard. Bot. Bruxelles 24: 338. 1954. — G. Forest 10820 (E).

Small tree or shrub. Branchlets stout, glabrous, with large, round leaf scars; apical buds with small, densely rusty pilose, ovate-lanceolate bud-scales. *Leaves* crowded near apex of branchlets, palmately veined, sub-reniform (broader than long), chartaceous, shallowly 3-lobed, the lobes either acuminate or very shortly acute; base cordate; up to 30 X 25 cm; upper surface glabrous, ribs rather flat; lower surface densely, woolly pilose (stellate hairs with short ramifications) ; of the 7 main ribs, the 3 or 5 central ones have 3—4 pairs of secondary nerves, tertiary nerves ladder-shaped, lax; upper leaf-surface slightly pitted (in dried condition) under the lens. Petiole up to 20 cm long, very minutely grey woolly at base or completely glabrous. *Inflorescence* 11 cm long, glabrous, but for the ends of the branches. Pedicels 0.5—1.5 cm long, grey-woolly; flower tube funnel-shaped, 3—4 mm long, woolly outside; inside with a dense layer of long, strigose, glossy hairs, protruding from the tube; lobes lanceolate, up to 1.5 cm long, reflexed, fleshy, inside glabrous, outside woolly. Androgynophore glabrous; male (?) one with a pinhead-like top of 10—15 anther-cells. Infructescence with dense felt-like, minute, woolly tomentum towards end of ramifications, glabrescent. *Follicles* 5, glabrous, up to 15 cm long and 6 cm wide (opened) with 3—5 subglobose, smooth seeds (10~ 15 mm in diam.) ; androgynophore 1 cm long, glabrous; stalk of follicles 2 cm, glabrous; pedicel 1 cm, densely pilose.

The species is manifestly related to *F. simplex,* from which it differs by its glabrous, larger carpels and its larger flowers.

CHINA. Yunnan, near Dali (Talifu), alt. 1750 m., May, fl., *Handel-Mazzetti 1132* (A); in thickets on the Tong Shan in the Yangtze bend, lat. 27°20' N., alt. 3000 m, fr-, *Forest 10820* (A, E); locality not indicated, fr., *Delavay s.n.* ,(P).

5. FIRMIANA DIVERSIFOLIA A. Gray.—**Fig. 8**

Firmiana diversifolia A. Gray, Botany U.S. Expl. Exped. 1: 185, *t. 13*. 1854; Ridley *in* Kew Bull. 1934: 214 (nomen) ; A. C. Smith *in* J. Arnold Arb. 36: 283. 1955; Kosterm., Comm. For. Res. Inst. Indon. 54: 21, /. *6*. 1956. — *Sterculia diversifolia* (non G. Don) Seemann, PL Vit. 23 (Viti, Append. 433) 1865 (nomen) ; Drake del Castillo, Illustr. Flor. Ins. Pacif. 122. 1886. — Pickering s.n. (US).

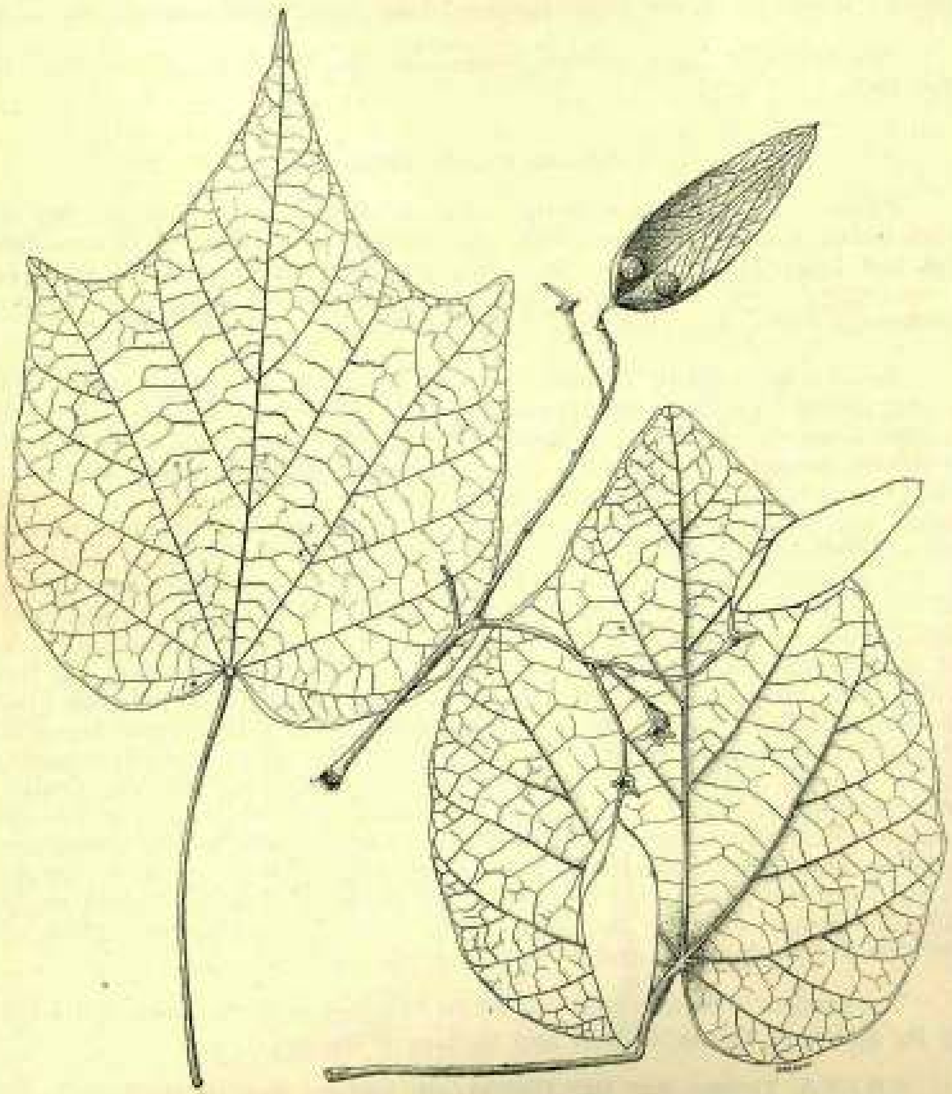


FIG. 8. *Firmiana diversifolia* A. Gray. — Leaves and infructescence (x 0.5). — After *Pickering s.n.* (P).

Tree of considerable size (Pickering'). *Leaves ovate*, palmately nerved, entire or three-lobed (lobes short, triangular, acute or acuminate), 15—24 x 12—20 cm, base cordate, thinly chartaceous or membranaceous, glabrous (or the lower surface and the branchlets etc, very minutely stellate puberulent under the lens) ; upper surface smooth, nerves flat; lower surface with 5 prominent main nerves, the 3 central ones with 3 pairs of lateral nerves (arcuate and running out at margin) ; tertiary nerves lax, laddershaped; veins inconspicuous. Petioles 10—12 mm long, rather slender, glabrous, hardly swollen at base. *Infructescence glabrous,* 14 cm long with few, distant, patent ramifications, up to 6 cm long. Pedicel densely pilose, 5 mm long. Androgynophore 5—6 mm long-, glabrous, broadened at apex into a pateriform cup. Stalks of follicles 5—10 mm long, almost glabrous. *Follicles* oblong-lanceolate, up to 2 x 7 cm, glabrous or nearly so, obtuse at both ends, abruptly tipped with a small mucroniform style. Seeds globular, glossy, 6 mm in diameter.

The species differs from *F. eoiorata* because of the few hairs on leaves and the lack of hairs in the axils of the main nerves. It is perhaps related to *F. papuana*, which has the same tomentum on branchlets and petioles, but differs by its cordate leaves and densely pilose fruit and lower leaf-surface.

FEEJEE ISL. Ovalau, fr., *Pickering* s.n. (P, US.).

6. FIRMIANA SIMPLEX (L.) W. F. Wight—**Fig. 9**

Firmiana simplex (L.) W. F. Wight *in* U.S. Dept. Agr. Bur. PL Industr. Bull. 142: 67. 1909; F. N. Meyer *in* Bull. 204: 56. 1911; Rehder & Wilson *in* Sargent, PL Wilson. 2 (2): 377. 1915; Arnold Arb. Exped. E. Asia 1917-18, *t. N-691*. 1920; Nyi *in* Contr. Biol. Lab. Sci. Soc. China 5 (3): 17-20, *fig.* 1929; Sasaki, Catal. Herb. Taihoku 343. 1930; Liu, Syst. bot. Fl. Fam. N. China 73. 1931; Yen *in* Bot. Gaz. 93: 206, 210. 1932; Chow, Fam. Trees Hopei (Fan Mem. Inst. Biol. Peiping, Handb. n. 4) 324. 1934; Shun Ching Lee, For. Bot. China 825. *pi. 230*, 1935; Kostermans *in* Bull. Jard. Bot. Bruxelles 24: 335. 1954; Comm. For. Res. Inst. 54: 26. 1956; Petelot, I.e. 125 (as a syn. of *Sterculia platanifolia* L.f.) ; Chittenden, Diet. Gard. 2, 2: 824. 1956. — *Clompanus simplex* (L.f.) O. Kuntze, Rev. 1: 77. 1891.

Firmiana platanifolia (L.f.) Marsili *in* Sagg. Sci. Lett. Ace. Pad. 1: 106-116. 1786; Schott & Endlicher, Melet. 33: 1832; Spach, Hist. Veg. phan. 3: 516. 1834, Atlas, *t. 69*. 1846; Steudel, NomencL, ed. 2, 1: 642. 1840; id. 2 (2): 640. (as a syn. of *Sterculia platanifolia* L.f.); R. Brown *in* Bennet & Brown, PL Jav. rar. 235. 1844; Walpers, Rep. 5: 104. 1845-46; Voigt, Hort. Suburb. Calcut. 104. 1845; Seemann, Bot. H.M.S. Herald 365. 1857; Miquel, Ann. Mus. Lugd. Bat. 3: 92. 1867; Prolus. 256. K. Schumann *in* Engl. & Prantl, Nat. Pfl.Fam. 3 (6) : 97, *fig. 49 B*. 1895; Hemsley *in* J. Linn. Soc. 23: 90. 1886 (as a syn. *Sterculia platanifolia* L.f.) ; Diels *in* Engl. bot. Jahrb. 29: 470. 1900; Britton, N. Amer. Trees 694. 1908; Shirasawa, Icon. Ess. for. Jap. 2: *t. 51 f. 10-34*. 1908; Makino, Illustir. FL Japan 969. 1924; Yushun kudo, etc. (Usef. Trees of Japan), ed. 2: 310. 1930; Terasaki, Nippon Shokubutsu Zufu 636,

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PIG. 9. *Firmiana simplex* (L.) W. F. Wight. — Leafy branch and inflorescence (x 0 4) • male and female flowers (x 2) ; follicles (X 0.4).

surface. Pinned to Sheet 875/12 in the Linnean Herbarium is another Sheet (875/13), which bears a single leaf mounted with the under surface showing; this leaf, also larger and less markedly lobed than the one on Sheet 875/12, is obviously of the same species and presumably came from the same plant. Neither of these sheets bears a determination by the elder or younger Linnaeus, but Smith has named Sheet 875/12 *Hibiscus simplex* and has further suggested that it is *StercuUa platanifolia.* This sheet also bears an inscription by Linnaeus indicating that the specimen was from Hortus Upsaliensis".

As Mr. Dandy points out, that *Hibiscus simplex* was described from a living plant that had not flowered, and that Sterculia platanifolia was described from a flowering specimen, it is possible that the plants on Sheets 875/12, 13 could be the type of *Hibiscus simplex* and even of *Sterculia platanifolia* also, if the flowering plant described by the younger Linnaeus was the mature stage of the young plant earlier described by the elder Linnaeus.

Mr. Dandy suggested to find out, whether in the living plant the domatia contain moisture, "in which case they could represent Linnaeus' poris melliferis."

As this is really the case, we now may accept the plants on the two sheets mentioned above as the type of *Hibiscus simplex* L., which is conspecific with *Firmiana platanifolia.* Thanks to the tenacity of Mr. Dandy, this problem now has been solved.

CHINA. North China, Peking: *de Bunge s.n.,* fl. (male) (P) (type of *S. pyriformis* Bunge) ; ibid., fl. (female), *Fortune s.n.* (P) ; Tsingtao, fl., (female). *Zimmermunn 463* (P) ; Szechuan, young fr., *Fang 2275* (P) ; Yunnan, May, fl. (female), *Ducloux 3486* (P); Shensi, ster., *Maximowiez s.n.* (P) ; Hongkong, fl. (female), *Hanee 5,12* (P); TONKIN, near Xinh Binh, fl. (female), *Bon 3893* (P) ; cult, near Ben Hue, fl., *Pierre 3205* (P) ; JAPAN. Nagasaki, cult., fr., *Maximowiez s.n.* (BO, Petrop.);" Kurachibishi, *Uno s.n.* (A). S. DOMINGO, cult, fl., Herb. *Piret s.n.* (P) ; MAURITIUS, cult., herb. *Sieber* Fl. Maurit. exciscc. part. II no *298,* female (P) ; N. AMERICA, locality not indicated, cult., fl. (female), *Bon s.n.* (P).

USE. — From the bark of young trees a fibre is obtained.

7. FIRMIANA PAPUANA Mildbread—Fig. 10

Firmiana' papuana Mildbread *in* Engl. Bot. Jahrb. 62: 365. 1929; Ridley *in* Kew Bull. 1934: 214 (nomen) ; Kosterm., Comm. For. Res. Inst. Indon. 54: 28, */. 8.* 1956. — Schlechter 17614 (Isotype in L).

Tree about 30—35 m tall; bole 20 m, buttressed up to 1 m, out 2 m. Bark greyish, mottled with green; when the outer dead corky layer of

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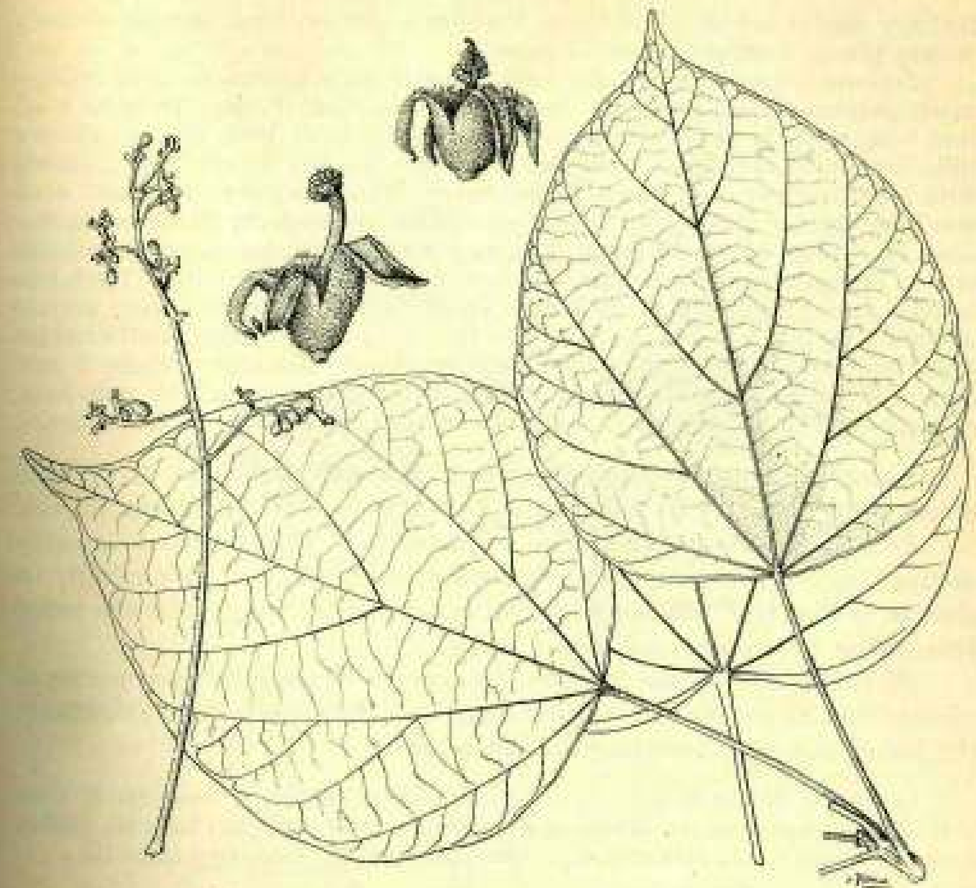


FIG. 10. *Firmiana papuana* Mildbread. — Leafy branch and inflorescence (x 0.6), after *Gray 4093* (BO) ; male flower (X 3), after *Gray 4093* (BO), female flower (X 3), after *Cavenaugh N.G.F. 4053* (BO).

3—5 mm is scraped off a green layer is revealed; living bark 15—20 mm, very pale straw coloured or orange with white streaks, yielding a little sap. Sapwood and heartwood not different, very pale straw yellow to nghtbrown. Branchlets rather slender, densely pilose (ramifications of stellate hairs rather long, somewhat appressed). *Leaves* palmately veined, chartaceous, dark-green, slightly squamose above, grey-green below (Floyd), ovate, not lobed, 12—20 x 10—16 cm, base as a rule truncate, top acute or subacuminate; above glossy green, soon glabrous (pilosity on nerves tardily disappearing), pitted or densely reticulate (when dried), nerves flat; lower surface covered with a dense, pale felt of woolly stellate hairs; the 5 main nerves prominent; the 3 central ones with 2—3 pairs of rather straight secondary nerves (at margin arcuate and running out) ;

tertiary nerves ladder-shaped, lax. Petioles 6—20 cm long, slender, densely woolly pilose, hardly swollen at base.

Inflorescence up to 30 cm long, densely pale brown or grey pilose; main peduncle long; branches short (3 cm), distant. Flower pedicels 1—2 mm long, densely pilose. *Flowers* delicate, purple or pink mauve. Flower tube depressed-urceolate, 1 mm long, outside densely woolly pilose, inside with a dense layer of strigose, glossy hairs; lobes lanceolate, reflexed, 4—5 mm long, rather fleshy, inside glabrous. Androgynophore glabrous, rather stout, 5—6 mm long; in male flowers bearing an irregular pinhead-like clump of anther-cells; in female flowers with densely pilose, flask-like ovaries, merging into conglutinate short styles with recurved, minute stigmas, at the base surrounded by the irregularly placed anther-cells. *Follicles* membranous, pilose outside, net-veined; androgynophore 7 mm long, its top broadened, pilose; stalks of follicles (young) 10 mm long, densely pilose; seeds ellipsoid, smooth, glossy, 2—3 pairs in each carpel.

According to a note accompanying Cavenaugh's specimen, the species occurs from sea level to 2500 m alt. Appearance: wide-spreading foliage.

By its pilose ovary the species is related to *F. platanifolia*. It is easily distinguished by its depressed urceolate tube. The felt-like pilosity is similar to that in *F. hainanensis*, which has similar leaves, but the latter species has glabrous, much larger carpels.

Firmiana diversifolia has similar carpels, which still show traces of pilosity (but of another type: the stellate hairs have very short branches); the leaves however, are glabrous and cordate.

SE. NEW GUINEA. Morobe Distr., Bulolo, alt. 800 m, June, fl., *E. Gray 8053* (BO, L); ibid., June, fl. and young fr., *Cavenaugh 5403* (BO, C); ibid., alt. 1200 m, June, fl., *Floyd N.G.F. 7416* (BO, L); Djamu R., Apr., fl., *Schlechter 17924* (L).

8. FIRMIANA HAINANENSIS Kosterm.—Fig. 11

Firmiana hainanensis Kostermans, Comm. For. Res. Inst. Indon. 54: 30, f. 9. 1956.

Tree, 14 m tall, 45 cm in diameter. Branches smooth; branchlets with scattered fimbriate scales. *Leaves* palmately veined, rather rigid, chartaceous, ovate, acutish, base truncate or rarely subcordate, 7—10 × 15 cm; upper surface glabrous, densely pitted, ribs flat; lower surface covered with a dense layer of fimbriate scales, pale; 5 main nerves of which the central one has 4—5 pairs of lateral nerves; the two lateral nerves with 3—4 strong lateral ramifications; tertiary nerves hardly visible. Petioles with scattered, minute scales, slender, 4—6 cm long, hardly swollen at base. *Fruit* pedicel 6 mm, pilose. Androgynophore 6 mm, glabrous, broadened into a pateriform part bearing the 5 glabrous follicles, which are up to 8 × 7.5 cm, apiculate or retuse, with 2—3 globular seeds, about 5—6 mm in diameter.

TYPE SPECIMEN. — *Lau 1932* (P).

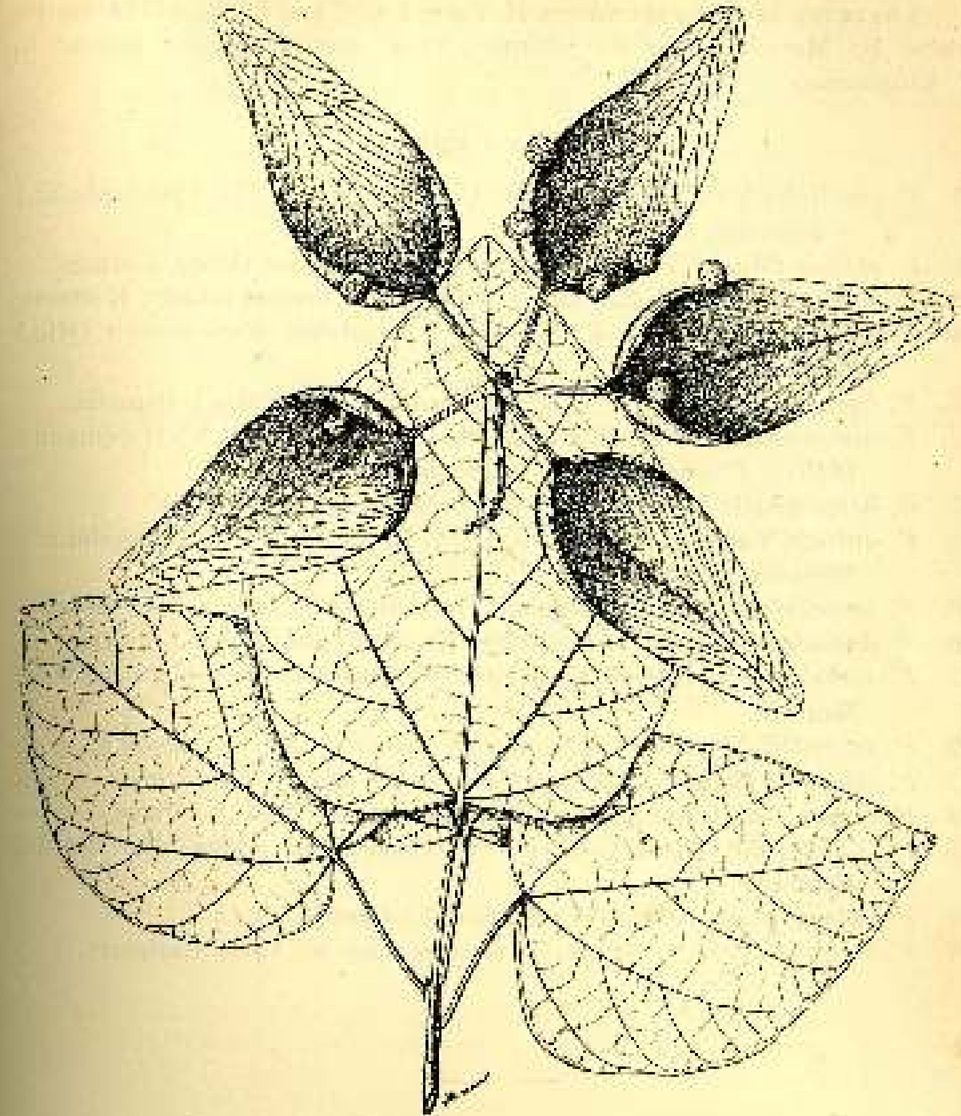


FIG. 11. *Firmiana hainanensis* Kosterm. (× 0.55). — After *Lau 1932* (P).

The leaves of this species are exactly like those of *F. papuana*, but it has larger, glabrous carpels. Further material is needed to differentiate it from *F. papuana*.

HAINAN. Chang-kiang distr., Ngo Ko Shan near Tsat Cha village, dry cliff, sandy soil, rare, June, fr., *Lau 1932* (P).

I have not seen the specimens H. Fung 20056 and Liang 61719, enumerated by Merrill under *F. colorata*. They may eventually belong to *F. hainanensis*.

EXCLUDED SPECIES

1. *F. acerifolia* Voigt, Hort. suburb. Calc. in Index XXII. 1845 (sphalm.) = *Sterculia acerifolia* Wall.
2. *F. affinis* (Mast.) Terr. = *Scaphium macropodum* (Miq.) Beumée.
3. *F. barteri* (Mast.) K. Schum. = *Hildegardia barteri* (Mast.) Kosterm.
4. *F. beccariama* (Pierre) K. Schum. = *Scaphium macropodum* (Miq.) Beumée.
5. *F. borneensis* Merrill = *Seaphiwm macropodum* (Miq.) Beumée.
6. *F. campanulata* Voigt, Hort. suburb. Calc. in Index p. XXII (sphalm.) 1845 = *Pterocymbium javanicum* R. Br.
7. *F. heterophylla* Pasq. = *Cola heterophylla* Schott & Endl.
8. *F. guttata* Voigt, Hort, suburb. Calc, Index XXII. 1845 (sphalm.) = *Sterculia guttata* Roxb.
9. *F. Umceaefolia* Voigt, I.e. (sphalm.) = *Sterculia lanceaefolia* Roxb.
10. *F. linearicarpa* Terr. = *Scaphium linearicarpum* (Mast.) Pierre.
11. *F. lychnophora* (Hance) K. Schum. = *Scaphium macropodum* (Miq.) Beumée.
12. *F. merrittii* Merrill = *Hildegardia merrittii* (Merr.) Kosterm.
13. *F. migeodii* Exell = *Hildegardia migeodii* (Exell) Kosterm.
14. *F. ornata* Voigt, I.e. XXII = *Sterculia- ornata* Wall, *ex* Voigt.
15. *F. populifolia* (Roxb.) Terr. = *Hildegardia populifolia,* (Roxb.) Kosterm.
16. *F. villosa* Voigt, I.e. XXII = *Sterculia villosa* Roxb.
17. *F. wallichii* Terr. = *Scaphium scasphigemm* (G. Don) Guibourt.